

Commonwealth of Kentucky
Division for Air Quality
PERMIT STATEMENT OF BASIS

DRAFT RENEWAL PERMIT
Title V / Synthetic Minor, Operating
Permit: V-08-042
GE Lighting, LLC
Somerset, KY 42503
February 10, 2009

Martha M. Allman, Reviewer

SOURCE ID: 21-199-00021
AGENCY INTEREST: 3809
ACTIVITY: APE20080001

SOURCE DESCRIPTION:

On June 23, 2008, GE Lighting LLC (GE) filed an application for the renewal of its Title V, synthetic minor operating permit (V-03-028). The facility is a major source of hazardous air pollutants and has taken self-imposed limits to avoid the applicability of 401 KAR 51:017, Prevention of Significant Deterioration. Additional information was requested and received on August 29, 2008, November 6, 2008, and December 29, 2008.

GE is a manufacturer of pressed glass lamp components (reflectors) using ceramic raw materials. Bulk ceramic raw materials are received and stored in silos or bins while other raw materials are received in containers. Materials used in bulk quantities include sand, aluminum hydrate, borax, boric acid, and sodium silica fluoride.

Manufacture of the glass entails melting a mixture of raw materials and cullet (scrap glass). In the glass melter/refiner, materials are melted at high temperatures. Molten glass is refined (residual trapped gases removed), and the temperature of the glass lowered so that it can be handled in the forming operation. Glass passes from the melter/refiner to the forming equipment via forehearth, relatively shallow refractory channels with means to control the glass temperature. Glass is removed continuously and is cut into "gobs" which are then pressed in the desired shapes. The pressed glass is then annealed before being packaged. Certain products made of specialty glass are washed with soap in an ultrasonic cleaner. Chromium is used in glass molds to ease removal of the glass from the molds.

SUMMARY OF EMISSION UNITS AND EMISSIONS:

The following is a list of significant emission units:

Emission Unit	Description	Applicable Regulation(s)
1000 (B-2)	10.4 MMBtu/hr Indirect Heat Exchanger	401 KAR 61:015
2000 (B-1)	20.9 MMBtu/hr Indirect Heat Exchanger	401 KAR 61:015

Emission Unit	Description	Applicable Regulation(s)
3000 (BM-1A)	Raw Material Unloading	401 KAR 59:010 Permit O-88-072
3002 (BM-1B1)	Bulk Material Unloading Conveyor	401 KAR 59:010 Permit O-88-072
3003 (BM-1B2)	Raw Material Unloading Elevator	401 KAR 59:010 Permit O-88-072
4001 (BM-2A)	Boric Acid Storage Silo and Anhydrous Boric Acid Storage Bin	401 KAR 59:010 Permit O-88-072
4002 (BM-2B)	Screened Sand Storage Silo	401 KAR 59:010 Permit O-88-072
4003 (BM-2A)	Cullet Storage Silo	401 KAR 59:010 Permit O-88-072
4004 (BM-2B)	Electrostatic Precipitator Catch Storage Silo	401 KAR 59:010 Permit O-88-072
4005 (BM-2A)	Sodium Silica Fluoride Storage Bin	401 KAR 59:010 Permit O-88-072
4006 (BM-2A)	Aluminum Hydrate Storage Bin	401 KAR 59:010 Permit O-88-072
4007 (BM-2A)	5 Mol Borax Bin	401 KAR 59:010 Permit O-88-072
4008 (BM-2A)	Unscreened Sand Storage Silo	401 KAR 59:010 Permit O-88-072
5001 (MH1-2A)	125 lb Raw Material Scale	401 KAR 59:010 Permit O-88-072
5002 (MH1-2B)	1000 lb Raw Material Scale	401 KAR 59:010 Permit O-88-072
5003 (MH1-2C)	3000 lb Raw Material Scale	401 KAR 59:010 Permit O-88-072
6000 (MH1-3)	Furnace Raw Materials Mixer	401 KAR 59:010 Permit O-88-072
7000 (MH1-5)	Mixed Batch Bin	401 KAR 59:010 Permit O-88-072
8001 (MH1-6A)	Furnace Batch Scale	401 KAR 59:010 Permit O-88-072
8002 (MH1-6B)	Furnace Cullet Scale	401 KAR 59:010 Permit O-88-072
9001 (MH1-7A)	Furnace Batch Screw Feeder	401 KAR 59:010 Permit O-88-072
9002 (MH1-7B)	Furnace Cullet Vibrating Conveyor	401 KAR 59:010 Permit O-88-072
9003 (MH1-7C)	Furnace Pocket Feed Conveyor	401 KAR 59:010 Permit O-88-072
10000 (MH1-9C2)	Furnace Cullet Elevator	401 KAR 59:010 Permit O-88-072
Emission Unit	Description	Applicable Regulation(s)

12000 (F1-1)	915 SF Melter/Refiner	401 KAR 53:010 401 KAR 63:020 40 CFR Subpart CC
18000 (F2-1)	100 SF #2 Furnace Melter/Refiner	401 KAR 53:010 401 KAR 63:020 401 KAR 61:020
22000 (CR-2)	Hard Chromium Electroplating	401 KAR 59:010 401 KAR 63:020 40 CFR 63 Subpart N
23000	Glass Cleaning	401 KAR 63:020

Actual and potential emissions are summarized below:

Pollutant	2007 Actual Emissions (tons/year)	Potential to Emit (tons/year)
PM ₁₀ /PM	10.85/13.34	41.67/41.97
SO ₂	4.48	10.13
NO _x	36.51	81.34
CO	2.46	13.41
VOC	4.06	9.10
Fluorides	4.34	16.08
HCl	4.83	9.70
Antimony	0.56	1.43
Chlorine	10.87	21.72
Titanium Dioxide	1.31	2.63
Chromium	1.7E-06	8.76E-04

APPLICABLE REGULATIONS, EMISSION UNITS, AND EMISSIONS:

E. Unit 1000 and 2000 Indirect Heat Exchangers

401 KAR 61:015 applies to the existing natural gas fired indirect heat exchanger units, which are less than 250 MMBtu per hour and constructed before April 9, 1972. Pursuant to 401 KAR 61:015, Section 4 (1), the particulate emissions from each emission unit (1000 and 2000) shall not exceed 0.63 lb/MMBtu based on a three-hour average. Pursuant to 401 KAR 61:015, Section 4(3), neither boiler stack shall have emissions equal to or greater than forty (40) percent opacity. Pursuant to 401 KAR 61:015, Section (5), the sulfur dioxide emissions from emission unit stack shall not exceed 3.55 lb/MMBtu based on a twenty-four-hour average.

Pursuant to 401 KAR 61:015, Section 4(3), neither boiler stack shall have emissions equal to or greater than forty (40) percent opacity, except for emissions from an indirect heat exchanger during building a new fire for the period required to bring the boiler up to operating conditions provided the method used is that recommended by the manufacturer and the time does not exceed the manufacturer's recommendations.

Emissions are based on the maximum heat capacity rating of the units and most recent AP-42, Chapter 1.4 Natural Gas Fired Combustion emission factors. These units are assumed to be in compliance with the allowable PM, opacity, and SO₂, limitations while burning natural gas.

Pursuant to 401 KAR 52:020, Section 26, the permittee shall monitor and record the amount of gas used on a monthly basis.

E. Unit 3001 - 10000 Miscellaneous Emission Units Constructed or Modified after 1975, Subject to 401 KAR 59:010, Listed in Operating Permit O-88-072

The raw materials (boric acid, sand, sodium silica fluoride, and aluminum hydrate) are received by railcar and unloaded into an underground hopper. Emission of particulate from the unloading is uncontrolled. Emission from the storage bins and an enclosed elevator are controlled by cloth filters, which are placed over the vents of each bin.

Once the raw materials are loaded into storage bins, they are processed for each of the two furnaces in the same way. The raw materials are pneumatically conveyed to the scales, then fed to the mixers. The mixed batches are then conveyed to the mixed batch bin (feeding the feed scales) which have emissions of particulate matter controlled by filters. The weighed mixed batch is conveyed to the feed hoppers, which feed the furnace on a continuous basis. Filters control particulate emissions from the feed scales, conveyer, and feed hopper.

Pursuant 401 KAR 59:010, Section 3(2) and Operating Permit O-88-072 sets particulate emission limitation on a lb/hr basis. In addition, the Operating Permit O-88-072 sets particulate emission limitation on a ton/yr basis. Per 401 KAR 59:010, visible emissions shall not equal or exceed 20% opacity.

Particulate emissions are based on the monthly operating rate (tons/month) x the emission factor (lb PM/ton) / Hours of operation per month (hr/month) x [1 – control device efficiency]. The permittee emission factors from each unit or transfer point were derived from factors presented in U.S. EPA's Source Assessment: Pressed and Blown Glass Manufacturing Plants (EPA-600/2-77-005), rated B for reliability.

Pursuant to 401 KAR 52:020, Section 26, the permittee shall monitor and record the amount and type of materials added to each silo each month.

Pursuant to 401 KAR 52:020, Section 26, the permittee shall monitor and record the pressure drop across the baghouse and RotoClone at least once per day.

Pursuant to 401 KAR 52:020, Section 26, the permittee shall perform a qualitative visual observation of the opacity of emissions from each stack on a weekly basis and maintain a log of the observations. If emissions from a stack are seen (not including condensed water vapor within the plume), then the opacity shall be determined by Reference Method 9. If emissions are in excess of the applicable opacity limit, then an inspection of control equipment shall be initiated for all necessary repairs;

E. Unit 3001 - 10000 Miscellaneous Emission Units Constructed or Modified after 1975, Subject to 401 KAR 59:010, Listed in Operating Permit O-88-072 (Continued)

The hourly processing and annual processing rates for the total throughput for emission units 3001, 3002, and 3003 and hourly and annual PM emission limitations are set in accordance with the Operating Permit O-88-072. At an emission factor of 1 lb PM/ton processing rate, that was referenced in the application from U.S. EPA's Source Assessment: Pressed and Blown Glass Manufacturing Plants (EPA-600/2-77-005), the source would be out of compliance with the emission limitations set in Operating Permit O-88-072, if the processing rate limits of 50 tons/hr and 29,000 tons/yr were followed. Therefore, the processing rate is limited to 32.4 tons processed per hour and 18,120 tons processed per year in the Title V permit.

E. Unit 12000 915 SF Melter/Refiner

Borosilicate glass is processed by the 915 SF melter/refiner. The raw materials are reacted together until molten glass is free of bubbles and inclusions. The furnace has two refractory chambers of checker works for preheating and heating of combustion gases. The heated gas flow is reversed between 10 and 30 minutes intervals, so that combustion air is drawn through previously heated chamber by flue gases. An electrostatic precipitator controls emissions from the furnace. The furnace also has a by-pass stack for use when the control equipment is down for maintenance.

40 CFR 60, Subpart CC – Standards of Performance for Glass Manufacturing Plants apply to the melter/refiner. The PM emission shall not exceed 0.5 grams of particulate/kg of glass produced. For compliance with the PM emission limit, an emission factor of 0.394 lbs PM/ton of raw material processed through the unit shall be used, based on the highest value from the 1993, 1995, and 1996 stack tests, until new information is gathered from the unit stack test that shall be performed within 6 months from issue of this permit. Emission factors derived from stack testing are to replace the emission factor currently listed in the permit, and shall be used to calculate future emissions.

Pursuant to 401 KAR 50:045, shall perform at least one compliance testing shall be within one year of the final permit V-08-042, using EPA Reference Method 5 or equivalent to determine the amount of PM emissions, EPA Reference Method 13 or equivalent to determine the amount of total fluoride emissions, EPA Reference Method 29 or equivalent to determine the amount of antimony emissions, and EPA Reference Method 26A or equivalent to determine the amount of chlorine emissions per ton of raw material processed through the unit.

Pursuant to 401 KAR 53:010, no person shall, directly or indirectly, emit into or discharge into the air, or cause, permit, or allow to be emitted or discharged into such air contaminants that shall cause or contribute to the pollution of the air of the Commonwealth in contravention of the emission standards or the ambient air standards (refer to primary and secondary ambient air quality standards in Appendix A to 401 KAR 53:010).

Pursuant to 401 KAR 52:020, the permittee shall monitor the daily raw material used and the glass pull rate.

E. Unit 18000 100 SF #2 Furnace Melter/Refiner

The 100 SF melter is identical in operation to the 915 SF melter, except that it is smaller and does not have electrical boosters. The molten glass flows through a trough (called forehearth), and is kept heated by natural gas direct heating. There are no controls for particulate matter emissions from this unit.

As requested by the applicant, the glass pull rate shall not exceed 0.17 tons/hr, to preclude the applicability of Prevention of Significant Deterioration of Air Quality, 401 KAR 51:017. Pursuant to Operating Permit O-88-072, the combined total processing rate of raw materials used in emission unit 18000 shall not exceed 1,118.21 tons/year. 401 KAR 61:020, Section 3 and Operating Permit O-88-072, apply a particulate emission limitation on a lb/hr rate. The Operating Permit O-88-072, has a particulate emission limitation on a ton/yr rate which applies at all time.

Pursuant to 401 KAR 61:020, Section 3(1), continuous emissions into the open air from the melter/refiner shall not be equal to or greater than forty (40) percent opacity.

To demonstrate compliance with the lb/hr particulate emission rate limitation, the rate will equal the monthly operating rate (tons/month) x Emission factor (lb PM/ton) / Hours of operation per month (hr/month) x [1 – control device efficiency].

Pursuant to 401 KAR 50:045, shall perform at least one compliance testing shall be within one year of the final permit V-08-042, using EPA Reference Method 5 or equivalent to determine the amount of PM emissions and EPA Reference Method 26A or equivalent to determine the amount of chlorine emissions per ton of raw material processed through the unit.

Pursuant to 401 KAR 52:020, Section 26, the permittee shall monitor and record monthly hours of operation/material processing rate.

Pursuant to 401 KAR 52:020, Section 26, the permittee shall perform a qualitative visual observation of the opacity of emissions from the stack on a weekly basis and maintain a log of the observations. If visible emissions from the stack are seen (not including condensed water vapor within the plume), then the opacity shall be determined by Reference Method 9. If emissions are in excess of the applicable opacity limit, then an inspection of the unit shall be initiated for all necessary repairs.

HAZARDOUS AIR POLLUTANTS: FROM THE TWO MELTERS

The Division for Air Quality (Division) has performed air dispersion model screening of potentially hazardous substances that may be emitted by the facility based upon the process rates, material formulations, stack heights and other pertinent information provided by the applicant. The following is a summary of the potentially hazardous substances upon which screening was performed, the modeled worst case impacts, and the level of concern (LOC) that triggers additional review and/or more detailed modeling.

Pollutant	Emissions Rate (lbs/hour)	Emissions Rate (grams/sec)	SCREEN3 Result (ug/m ³)	Convert to annual (ug/m ³)	LOC (ug/m ³)
Antimony	0.06	0.00756	8.78E-01	7.02E-02	2.00E-02
Chlorine	5.04	0.63504	1.33E+01	1.06E+00	2.00E-02
Chromium	0.0002	0.0000252	5.36E-04	4.29E-05	2.00E-04
Fluorides	3.621	0.456246	9.84E+00	7.87E-01	1.40E+00
HCl	2.21	0.27846	5.94E+00	4.75E-01	2.00E+00
Titanium Dioxide	0.6	0.0756	1.61E+00	1.29E-01	1.00E+02

Based on the results of the screening analysis the Division has including testing requirements in the permit for antimony and chlorine, which are emitted by the two melters (915 SF Melter and 100 SF #2 Furnace Melter/Refiner). Emission rates determined by testing shall be used in SCREEN3 and reported to the Division at the same time as the results of the performance tests. If the predicted annual concentrations exceed $0.02 \mu\text{g}/\text{m}^3$ for either pollutant, the permittee shall conduct more refined modeling using models approved by the Division. If the predicted concentrations of antimony and chlorine exceed $0.02 \mu\text{g}/\text{m}^3$ for either pollutant, within 90 days of the stack test, the permittee shall propose a plan to reduce antimony and chlorine emissions below $0.02 \mu\text{g}/\text{m}^3$ or provide evidence that the permittee is not emitting potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals and plants [401 KAR 63:020].

Air dispersion modeling was performed by GE Lighting and submitted to the Division on November 19, 2004 to demonstrate compliance with the hydrogen fluoride standard listed in 401 KAR 53:010. The modeling was conducted using the Industrial Source Complex Short-term (ISCST3 version 02035) model and five years of meteorological data (Lexington, Kentucky 1985-1987 and 1989-1990). A Good Engineering Practice (GEP) stack height analysis was completed and direction-specific building profile dimensions were calculated to simulate potential downwash interactions. Results are summarized below:

Averaging Time	Maximum Modeled Impact ($\mu\text{g}/\text{m}^3$)	Primary Ambient Standard ($\mu\text{g}/\text{m}^3$)	Secondary Ambient Standard ($\mu\text{g}/\text{m}^3$)
Maximum Value	3.26	400	--
Annual Mean	0.47	--	.82
Max. One Month Average	0.52	--	1.64
Maximum One-Week Average	1.17	800	--
Maximum 24-hr Average	3.26	--	--

E. Unit 22000 Hard Chromium Electroplating

The hard chromium-electroplating tank was constructed or modified after 1975. The unit was tested in 1996 for compliance with NESHAP. The volumetric flow rate of the hood over the plating tank was determined to be 4,008 dscm/hr. The unit is rated at 1000 amp-hr/hr, and is controlled by a packed bed scrubber/composite mesh pad system.

40 CFR 63, Subpart N sets the national emission standards for chromium emissions from hard and decorative chromium electroplating and chromium anodizing tanks. 401 KAR 59:010 applies to the new process operations.

40 CFR 63.342(f) defines the work practice standards for the unit. Total chromium emissions shall not equal or exceed $0.03 \text{ mg}/\text{dscm}$ or $1.3\text{E-}05 \text{ gr}/\text{dscf}$ [40CFR63.342(c)(1)(ii)]. Pursuant to 401 KAR 59:010, Section 3(2) and in accordance with the Operating Permit O-88-072, particulate emissions shall not exceed 2.34 lb/hr. Pursuant to Operating Permit O-88-072, particulate emission shall not exceed 2.68 tons per year. Pursuant to 401 KAR 59:010, continuous emissions into the open air from the tank's stack shall not be equal to or greater than twenty (20) percent opacity.

From test data on the unit in 1996, it was assumed that all the particulate matter emitted from the unit was

total chromium. For compliance with the PM and total chromium emission limit, an emission factor of 0.0395 mg/amp-hr shall be used for each, based on the average of three test runs performed on 12/6/96, until new information is gathered from the compliance test that shall be performed within one year from issue of the final permit (V-08-042). Emission factors derived from compliance testing are to replace the emission factor currently listed in the permit, and shall be used to calculate future emissions.

Pursuant to 401 KAR 50:045, the permittee shall conduct a chromium compliance test within one year of the issuance date of the final permit (V-08-042), using EPA Reference Method 306.

Monitoring of the mesh pad and the control devices shall be done in accordance with the requirements of 40 CFR 63.342 and 40 CFR 63.432. Pursuant to 401 KAR 52:020, Section 26, the permittee shall perform a qualitative visual observation of the opacity of emissions from the stack on a weekly basis and maintain a log of the observations. If visible emissions from the stack are seen (not including condensed water vapor within the plume), then the opacity shall be determined by Reference Method 9. If emissions are in excess of the applicable opacity limit, then an inspection of the control unit shall be initiated for all necessary repairs. The permittee shall maintain records shall be maintained in accordance with 40 CFR 63.346, and satisfy the reporting with the conditions set forth in 40 CFR 63.347

E. Unit 23000 Glass Cleaning

The glass cleaning operation consists of seven 42-gallon washing tanks, two soap mixing tanks, four holding reservoirs, and one reverse-osmosis de-ionized water purification system. The maximum production rate is 1 gallon oxide remover (0.01 % ammonia)/hr and 1 gallon ethanolamine solution (10 % ethanolamine)/hr. The unit was constructed after 1975, and there are no controls for emissions.

Pursuant to KAR 63:020, persons responsible for a source from which hazardous matter or toxic substances may be emitted shall provide the utmost care and consideration, in the handling of these materials, to the potentially harmful effects of the emissions resulting from such activities. Pursuant to KAR 63:020 and in accordance with the state-only requirements in C-92-008, the ethanolamine feed rate shall not exceed 0.8905 lb/hr. Based on the results a screening model for ethanolamine emissions and the maximum production rates indicated in the application, the permittee received Construction Permit C-92-008. The source will be in compliance, as long as the operating limitation or the feed rate is not exceeded. Pursuant to 401 KAR 52:020, Section 26, the permittee shall maintain and records of amounts of HAP/VOC containing material used shall be kept on a monthly basis.

EMISSION AND OPERATING CAPS DESCRIPTION:

To demonstrate compliance with 401 KAR 63:020, and in accordance with the state-only requirements in Operating Permit O-88-072 and Construction permit C-92-008:

Source wide emission of ethanolamine shall not exceed 1.98 lb/hr.

Hydrogen chloride emission from the source shall not exceed 8.40 lb/hr and 36.8 tons/yr.

Antimony trioxide emission from the source shall not exceed 0.598 and 2.62 tons/yr.

Titanium dioxide emission from the source shall not exceed 5.98 lb/hr and 26.2 tons/yr.

OPERATIONAL FLEXIBILITY:

None

CREDIBLE EVIDENCE:

This permit contains provisions which require that specific test methods, monitoring or recordkeeping be used as a demonstration of compliance with permit limits. On February 24, 1997, the U.S. EPA promulgated revisions to the following federal regulations: 40 CFR Part 51, Sec. 51.212; 40 CFR Part 52, Sec. 52.12; 40 CFR Part 52, Sec. 52.30; 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12, that allow the use of credible evidence to establish compliance with applicable requirements. At the issuance of this permit, Kentucky has only adopted the provisions of 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12 into its air quality regulations.